FORM PTO-1449

INFORMATION DISCLOSURE STATEMENT

| ATTY. DOCKET NO. | APPLICATION NO. |
|---|---|
| SP038.C5 (1397.0140005) | To Be Assigned 10/815,742 |
| FIRST NAMED INVENTOR | |
| WANG et al. | |
| FILING DATE | ART UNIT |
| April 2, 2004 | To Be Assigned |

## U.S. PATENT DOCUMENTS

| EXAMINER INITIAL | | DOCUMENT NUMBER | DATE | NAME | CLASS | SUB-CLASS | FILING DATE |
|---|---|---|---|---|---|---|---|
| RLE | AA1 | 4,626,989 | 12/02/1986 | Torii | | | |
| RLE | AB1 | 4,675,806 | 06/23/1987 | Uchida | | | |
| RLE | AC1 | 4,722,049 | 01/26/1988 | Lahti | | | |
| RLE | AD1 | 4,807,115 | 02/21/1989 | Torng | | | |
| RLE | AE1 | 4,823,201 | 04/18/1989 | Simon et al. | | | |
| RLE | AF1 | 4,903,196 | 02/20/1990 | Pomerene et al. | | | |
| RLE | AG1 | 4,942,525 | 07/17/1990 | Shintani et al. | | | |
| RLE | AH1 | 5,067,069 | 11/19/1991 | Fite et al. | | | |
| RLE | AI1 | 5,072,364 | 12/10/1991 | Jardine et al. | | | |
| RLE | AJ1 | 5,109,495 | 04/28/1992 | Fite et al. | | | |
| RLE | AK1 | 5,125,083 | 06/23/1992 | Fite et al. | | | |

## FOREIGN PATENT DOCUMENTS

| EXAMINER INITIAL | | DOCUMENT NUMBER | DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | AL1 | WO 88/09035 | 11/1988 | ~~PCT~~ WIPO | | | Yes No |
| | AM1 | 0 515 166 | 11/1992 | ~~EP~~ EPO | | | Yes No |
| RLE | AN1 | H2-48732 | 02/19/1990 | Japan | | | Yes No |

## OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

| | | | |
|---|---|---|---|
| RLE | AO | 1 | Acosta, R. D. *et al.*, "An Instruction Issuing Approach to Enhancing Performance in Multiple Functional Unit Processors," *IEEE Transactions On Computers*, IEEE, Vol. C-35, No. 9, pp. 815-828 (September 1986). |
| RLE | AP | 1 | Agerwala, T. and Cocke, J., "High Performance Reduced Instruction Set Processors," IBM Research Division, pp. 1-61 (March 31, 1987). |
| RLE | AR | 1 | Butler, M. and Patt, Y., "An Improved Area-Efficient Register Alias Table for Implementing HPS," University of Michigan, Ann Arbor, Michigan, 24 pages (January 1990). |
| RLE | AS | 1 | Butler, M. *et al.*, "Single Instruction Stream Parallelism Is Greater than Two," *Proceedings of the 18th Annual International Symposium on Computer Architecture*, ACM, pp. 276-286 (May 1991). |
| RLE | AT | 1 | Charlesworth, A.E., "An Approach to Scientific Array Processing: The Architectural Design of the AP-120B/FPS-164 Family," *Computer*, IEEE, Vol. 14, pp. 18-27 (September 1981). |

EXAMINER Richard Ellis — DATE CONSIDERED 10/14/2004

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| | FIRST NAMED INVENTOR<br>WANG et al. | |
| | FILING DATE<br>April 2, 2004 | ART UNIT<br>To Be Assigned |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | | DOCUMENT NUMBER | DATE | NAME | CLASS | SUB-CLASS | FILING DATE |
|---|---|---|---|---|---|---|---|
| RLE | AA2 | 5,148,536 | 09/15/1992 | Witek et al. | | | |
| RLE | AB2 | 5,167,026 | 11/24/1992 | Murray et al. | | | |
| RLE | AC2 | 5,179,673 | 01/12/1993 | Steely, Jr. et al. | | | |
| RLE | AD2 | 5,197,132 | 03/23/1993 | Steely, Jr. et al. | | | |
| RLE | AE2 | 5,214,763 | 03/25/1993 | Blaner et al. | | | |
| RLE | AF2 | 5,222,240 | 06/22/1993 | Patel | | | |
| RLE | AG2 | 5,226,126 | 07/06/1993 | McFarland et al. | | | |
| RLE | AH2 | 5,230,068 | 07/20/1993 | Van Dyke et al. | | | |
| RLE | AI2 | 5,251,306 | 10/05/1993 | Tran | | | |
| RLE | AJ2 | 5,317,720 | 05/31/1994 | Stamm et al. | | | |
| RLE | AK2 | 5,345,569 | 09/06/01994 | Tran | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | | DOCUMENT NUMBER | DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| RLE | AL2 | H4-96132 | 03/27/1992 | Japan | | | Yes No |
| RLE | AM2 | H6-19707 | 01/28/1994 | Japan | | | Yes No |
| \ | AN2 | | | | | | Yes No |

**OTHER (Including Author, Title, Date, Pertinent Pages, etc.)**

| | | | |
|---|---|---|---|
| RLE | AO | 2 | Colwell, R.P. *et al.*, "A VLIW Architecture for a Trace Scheduling Compiler," *Proceedings of the 2nd International Conference on Architectural Support for Programming Languages and Operating Systems*, ACM, pp. 180-192 (October 1987). |
| RLE | AP | 2 | Dwyer, H, *A Multiple, Out-of-Order Instruction Issuing System for Superscalar Processors*, UMI, pp. 1-249 (August 1991). |
| RLE | AR | 2 | Foster, C.C. and Riseman, E.M., "Percolation of Code to Enhance Parallel Dispatching and Execution," *IEEE Transactions On Computers*, IEEE, pp. 1411-1415 (December 1971). |
| RLE | AS | 2 | Gee, J. *et al.*, "The Implementation of Prolog via VAX 8600 Microcode," *Proceedings of Micro 19*, IEEE, October 1986, pp.68-74. |
| RLE | AT | 2 | Gross, T.R. and Hennessy, J.L., "Optimizing Delayed Branches," *Proceedings of the 5th Annual Workshop on Microprogramming*, IEEE, pp. 114-120 (October 5-7, 1982). |

EXAMINER Richard Elling DATE CONSIDERED 10/14/2004

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| EXAMINER INITIAL | | DOCUMENT NUMBER | DATE | NAME | CLASS | SUB-CLASS | FILING DATE |
|---|---|---|---|---|---|---|---|
| RLE | AA3 | 5,355,457 | 10/11/1994 | Shebanow et al. | | | |
| RLE | AB3 | 5,367,660 | 11/22/1994 | Gat et al. | | | |
| RLE | AC3 | 5,390,355 | 02/14/1995 | Horst | | | |
| RLE | AD3 | 5,398,330 | 03/14/1995 | Johnson | | | |
| RLE | AE3 | 5,430,888 | 07/04/1995 | Witek et al. | | | |
| RLE | AF3 | 5,442,757 | 08/15/1995 | McFarland et al. | | | |
| RLE | AG3 | 5,487,156 | 01/23/1996 | Popescu et al. | | | |
| RLE | AH3 | 5,560,032 | 09/24/1996 | Nguyen et al. | | | |
| RLE | AI3 | 5,561,776 | 10/01/1996 | Popescu et al. | | | |
| RLE | AJ3 | 5.568,624 | 10/22/1996 | Sites et al. | | | |
| RLE | AK3 | 5,574,927 | 11/12/1996 | Scantlin | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | | DOCUMENT NUMBER | DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | AL3 | | | | | | Yes<br>No |
| | AM3 | | | | | | Yes<br>No |
| | AN3 | | | | | | Yes<br>No |

**OTHER (Including Author, Title, Date, Pertinent Pages, etc.)**

| | | | |
|---|---|---|---|
| RLE | AO | 3 | Hennessy, J.L. and Patterson, D.A., *Computer Architecture: A Quantitative Approach*, Morgan Kaufmann Publishers, pp. xi-xv, 257-278, 290-314 and 449 (1990). |
| RLE | AP | 3 | Hwu, W-M. W. and Patt, Y.N., "Checkpoint Repair for High-Performance Out-of-Order Execution Machines," *IEEE Trans. On Computers*, IEEE, Vol. C-36, No. 12, pp. 1496-1514 (December 1987). |
| RLE | AR | 3 | Hwu, W. and Patt, Y., "Design Choices for the HPSm Microprocessor Chip," *Proceedings of the Twentieth Annual Hawaii International Conference on System Sciences*, pp. 330-336 (1987). |
| RLE | AS | 3 | Hwu, W-M. W. and Chang, P.P., "Exploiting Parallel Microprocessor Microarchitectures with a Compiler Code Generator," *Proceedings of the 15th Annual Symposium on Computer Architecture*, IEEE, pp. 45-53 (June 1988). |
| RLE | AT | 3 | Hwu, W-M. *et al.*, "An HPS Implementation of VAX: Initial Design and Analysis," *Proceedings of the Nineteenth Annual Hawaii International Conference on System Sciences*, pp. 282-291 (1986). |

EXAMINER Richard Ellis — DATE CONSIDERED 10/14/2004

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|---|---|---|---|---|---|---|---|
| RLE | AA4 | 5,592,636 | 01/07/1997 | Popescu et al. | | | |
| RLE | AB4 | 5,625,837 | 04/29/1997 | Popescu et al. | | | |
| RLE | AC4 | 5,627,983 | 05/06/1997 | Popescu et al. | | | |
| RLE | AD4 | 5,630,149 | 05/13/1997 | Bluhm | | | |
| RLE | AE4 | 5,651,125 | 07/22/1997 | Witt et al. | | | |
| RLE | AF4 | 5,708,841 | 01/13/1998 | Popescu et al. | | | |
| RLE | AG4 | 5,768,575 | 06/16/1998 | McFarland et al. | | | |
| RLE | AH4 | 5,778,210 | 07/07/1998 | Henstrom et al. | | | |
| RLE | AI4 | 5,797,025 | 08/18/1998 | Popescu et al. | | | |
| RLE | AJ4 | 5,826,055 | 10/20/1998 | Wang et al. | | | |
| RLE | AK4 | 5,832,205 | 11/03/1998 | Kelly et al. | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | | DOCUMENT NUMBER | DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | AL4 | | | | | | Yes<br>No |
| | AM4 | | | | | | Yes<br>No |
| | AN4 | | | | | | Yes<br>No |

**OTHER (Including Author, Title, Date, Pertinent Pages, etc.)**

| | | | |
|---|---|---|---|
| RLE | AO | 4 | Hwu, W-M. and Patt, Y.N., "HPSm, a High Performance Restricted Data Flow Architecture Having Minimal Functionality," *Proceedings from ISCA-13*, IEEE, pp. 297-306 (June 2-5, 1986). |
| RLE | AP | 4 | Hwu, W. and Patt, Y., "HPSm2: A Refined Single-Chip Microengine," *HICSS '88*, IEEE,pp. 30-40 (1988). |
| RLE | AR | 4 | *IBM Journal of Research and Development*, IBM, Vol. 34, No. 1, pp. 1-70 (January 1990). |
| RLE | AS | 4 | Johnson, M. *Superscalar Microprocessor Design*, Prentice-Hall, pp. vii-xi and 87-125 (1991). |
| RLE | AT | 4 | Johnson, W. M., *Super-Scalar Processor Design*, (Dissertation), 134 pages (1989). |

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|---|---|---|---|---|---|---|---|
| RLE | AA5 | 5,832,293 | 11/03/1998 | Popescu et al. | — | — | — |
| RLE | AB5 | 6,131,157 | 10/10/2000 | Wang et al. | — | — | — |
| RLE | AC5 | 6,412,064 | 06/25/2002 | Wang et al. | — | — | — |
| RLE | AD5 | 5,961,629 | 10/05/1999 | Nguyen et al. | — | — | — |
| | AE5 | | | | | | |
| | AF5 | | | | | | |
| | AG5 | | | | | | |
| | AH5 | | | | | | |
| | AI5 | | | | | | |
| | AJ5 | | | | | | |
| | AK5 | | | | | | |

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|---|---|---|---|---|---|---|---|
| | AL5 | | | | | | Yes No |
| | AM5 | | | | | | Yes No |
| | AN5 | | | | | | Yes No |

**OTHER (Including Author, Title, Date, Pertinent Pages, etc.)**

| | | | |
|---|---|---|---|
| RLE | AO | 5 | Jouppi, N.P. and Wall, D.W., "Available Instruction-Level Parallelism for Superscalar and Superpipelined Machines," *Proceedings of the 3rd International Conference on Architectural Support for Programming Languages and Operating Systems*, ACM, pp. 272-282 (April 1989). |
| RLE | AP | 5 | Keller, R.M., "Look-Ahead Processors," *Computing Surveys*, ACM, Vol. 7, No. 4, pp. 177-195 (December 1975). |
| RLE | AR | 5 | Lightner, B.D. and Hill, G., "The Metaflow Lightning Chipset", *Compcon Spring 91*, IEEE, pp. 13-18 (February 25 - March 1, 1991). |
| RLE | AS | 5 | Patt, Y.N. *et al.*, "Critical Issues Regarding HPS, A High Performance Microarchitecture", *Proceedings of 18th Annual Workshop on Microprogramming*, IEEE, pp. 109-116 (December 3-6, 1985). |
| RLE | AT | 5 | Hwu *et al.*, "Experiments with HPS, a Restricted Data Flow Microarchitecture for High Performance Computers," *COMPCON 86*, IEEE, pp. 254-258 (1986). |

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|---|---|---|---|---|---|---|---|
| | AA6 | | | | | | |
| | AB6 | | | | | | |
| | AC6 | | | | | | |
| | AD6 | | | | | | |
| | AE3 | | | | | | |
| | AF6 | | | | | | |
| | AG6 | | | | | | |
| | AH6 | | | | | | |
| | AI6 | | | | | | |
| | AJ6 | | | | | | |
| | AK6 | | | | | | |

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|---|---|---|---|---|---|---|---|
| | AL6 | | | | | | Yes<br>No |
| | AM6 | | | | | | Yes<br>No |
| | AN6 | | | | | | Yes<br>No |

**OTHER (Including Author, Title, Date, Pertinent Pages, etc.)**

| | | | |
|---|---|---|---|
| RUE | AO | 6 | Patt, Y.N. *et al.*, "HPS, A New Microarchitecture: Rationale and Introduction", *The 18th Annual Workshop on Microprogramming*, Pacific Grove, CA, December 3-6, 1985, IEEE Computer Society Order No. 653, pp. 103-108. |
| RUE | AP | 6 | Patt *et al.*, "Run-Time Generation of HPS Microinstructions From a VAX Instruction Stream," *Proceedings of MICRO 19 Workshop*, New York, pp. 75-81 (October 1986). |
| RUE | AR | 6 | Peleg, A. and Weiser, U., "Future Trends in Microprocessors: Out-of-Order Execution, Speculative Branching and their CISC Performance Potential", IEEE, pp. 263-266 (1991). |
| RUE | AS | 6 | Pleszkun, A.R. and Sohi, G.S., "The Performance Potential of Multiple Functional Unit Processors," *Proceedings of the 15th Annual Symposium on Computer Architecture*, IEEE, pp. 37-44 (June 1988). |
| RUE | AT | 6 | Pleszkun, A.R. *et al.*, "WISQ: A Restartable Architecture Using Queues," *Proceedings of the 14th International Symposium on Computer Architecture*, ACM, pp. 290-299 (June 1987). |

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|---|---|---|---|---|---|---|---|
| | AA7 | | | | | | |
| | AB7 | | | | | | |
| | AC7 | | | | | | |
| | AD7 | | | | | | |
| | AE7 | | | | | | |
| | AF7 | | | | | | |
| | AG7 | | | | | | |
| | AH7 | | | | | | |
| | AI7 | | | | | | |
| | AJ7 | | | | | | |
| | AK7 | | | | | | |

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|---|---|---|---|---|---|---|---|
| | AL7 | | | | | | Yes No |
| | AM7 | | | | | | Yes No |
| | AN7 | | | | | | Yes No |

**OTHER (Including Author, Title, Date, Pertinent Pages, etc.)**

| | | | |
|---|---|---|---|
| RLE | AO | 7 | Popescu, V. *et al.*, "The Metaflow Architecture", *IEEE Micro*, IEEE, Vol. 11, No.3, pp. 10-13 and 63-73 (June 1991). |
| RLE | AP | 7 | Smith, J.E. and Pleszkun, A.R., "Implementation of Precise Interrupts in Pipelined Processors," *Proceedings of the 12th Annual International Symposium on Computer Architecture*, IEEE, pp. 36-44 (June 1985). |
| RLE | AR | 7 | Smith, M.D. *et al.*, "Limits on Multiple Instruction Issue," *Computer Architecture News*, ACM, No. 2, pp. 290-302 (April 3-6, 1989). |
| RLE | AS | 7 | Sohi, G.S. and Vajapeyam, G.S., "Instruction Issue Logic For High-Performance, Interruptable Pipelined Processors," *Conference Proceedings of the 14th Annual International Symposium on Computer Architecture*, pp. 27-34 (June 2-5, 1987). |
| RLE | AT | 7 | Thornton, J.E., *Design of a Computer: The Control Data 6600*, Control Data Corporation, pp. 57-140 (1970). |

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|---|---|---|---|---|---|---|---|
| | AA8 | | | | | | |
| | AB8 | | | | | | |
| | AC8 | | | | | | |
| | AD8 | | | | | | |
| | AE8 | | | | | | |
| | AF8 | | | | | | |
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| | AH8 | | | | | | |
| | AI8 | | | | | | |
| | AJ8 | | | | | | |
| | AK3 | | | | | | |

**FOREIGN PATENT DOCUMENTS**

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|---|---|---|---|---|---|---|---|
| | AL8 | | | | | | Yes<br>No |
| | AM8 | | | | | | Yes<br>No |
| | AN8 | | | | | | Yes<br>No |

**OTHER (Including Author, Title, Date, Pertinent Pages, etc.)**

| | | | |
|---|---|---|---|
| RUE | AO | 8 | Tjaden, G.S. and Flynn, M.J., "Detection and Parallel Execution of Independent Instructions," *IEEE Trans. On Computers*, IEEE, Vol. C-19, No. 10, pp. 889-895 (October 1970). |
| RUE | AP | 8 | Tjaden, G.S., *Representation and Detection of Concurrency Using Ordering Matrices*, (Dissertation), UMI, pp. 1-199 (1972). |
| RUE | AR | 8 | Tjaden *et al.*, "Representation of Concurrency with Ordering Matrices," *IEEE Transactions On Computers*, IEEE, Vol. C-22, No. 8, pp. 752-761 (August 1973). |
| RUE | AS | 8 | Tomasulo, R.M., "An Efficient Algorithm for Exploiting Multiple Arithmetic Units," *IBM Journal*, IBM, Vol. 11, pp. 25-33 (January 1967). |
| RUE | AT | 8 | Uht, A.K., "An Efficient Hardware Algorithm to Extract Concurrency From General-Purpose Code," *Proceedings of the 19th Annual Hawaii International Conference on System Sciences*, HICSS, pp. 41-50 (1986). |

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|---|---|---|---|---|---|---|---|
| | AA9 | | | | | | |
| | AB9 | | | | | | |
| | AC9 | | | | | | |
| | AD9 | | | | | | |
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| | AF9 | | | | | | |
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| | AH9 | | | | | | |
| | AI9 | | | | | | |
| | AJ9 | | | | | | |
| | AK9 | | | | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | | DOCUMENT NUMBER | DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | AL9 | | | | | | Yes No |
| | AM9 | | | | | | Yes No |
| | AN9 | | | | | | Yes No |

**OTHER (Including Author, Title, Date, Pertinent Pages, etc.)**

| | | | |
|---|---|---|---|
| RLE | AO | 9 | Uvieghara, G.A. *et al.*, "An Experimental Single-Chip Data Flow CPU," *Symposium on ULSI Circuits Design Digest of Technical Papers*, 2 pages (May 1990). |
| RLE | AP | 9 | Uvieghara, G.A. *et al.*, "An Experimental Single-Chip Data Flow CPU," *IEEE Journal of Solid-State Circuits*, IEEE, Vol. 27, No. 1, pp. 17-28 (January 1992). |
| RLE | AR | 9 | Wedig, R.G., *Detection of Concurrency In Directly Executed Language Instruction Streams*, (Dissertation), UMI, pp. 1-179 (June 1982). |
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| EXAMINER Richard Ellis | DATE CONSIDERED 10/14/2004 |
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| FORM PTO-1449<br>INFORMATION DISCLOSURE STATEMENT | ATTY. DOCKET NO.<br>SP038.C5 (1397.0140005) | APPLICATION NO.<br>To Be Assigned 10/815,742 |
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| | FIRST NAMED INVENTOR<br>WANG et al. | |
| | FILING DATE<br>April 2, 2004 | ART UNIT<br>To Be Assigned |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | | DOCUMENT NUMBER | DATE | NAME | CLASS | SUB-CLASS | FILING DATE |
|---|---|---|---|---|---|---|---|
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| | AB10 | | | | | | |
| | AC10 | | | | | | |
| | AD10 | | | | | | |
| | AE10 | | | | | | |
| | AF10 | | | | | | |
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| | AI10 | | | | | | |
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**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | | DOCUMENT NUMBER | DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | AL10 | | | | | | Yes<br>No |
| | AM10 | | | | | | Yes<br>No |
| | AN10 | | | | | | Yes<br>No |

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